UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF COMMERCIAL FISHERIES

CALIFORNIA FISHERY MARKET NEWS MONTHLY SUMMARY

December 1960

Part II–Fishing Information*

Sea-surface temperatures, fishing and research information of interest to the West Coast tuna-fishing industry and marine scientists

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SONAR USED SUCCESSFULLY ON YELLOWFIN TUNA

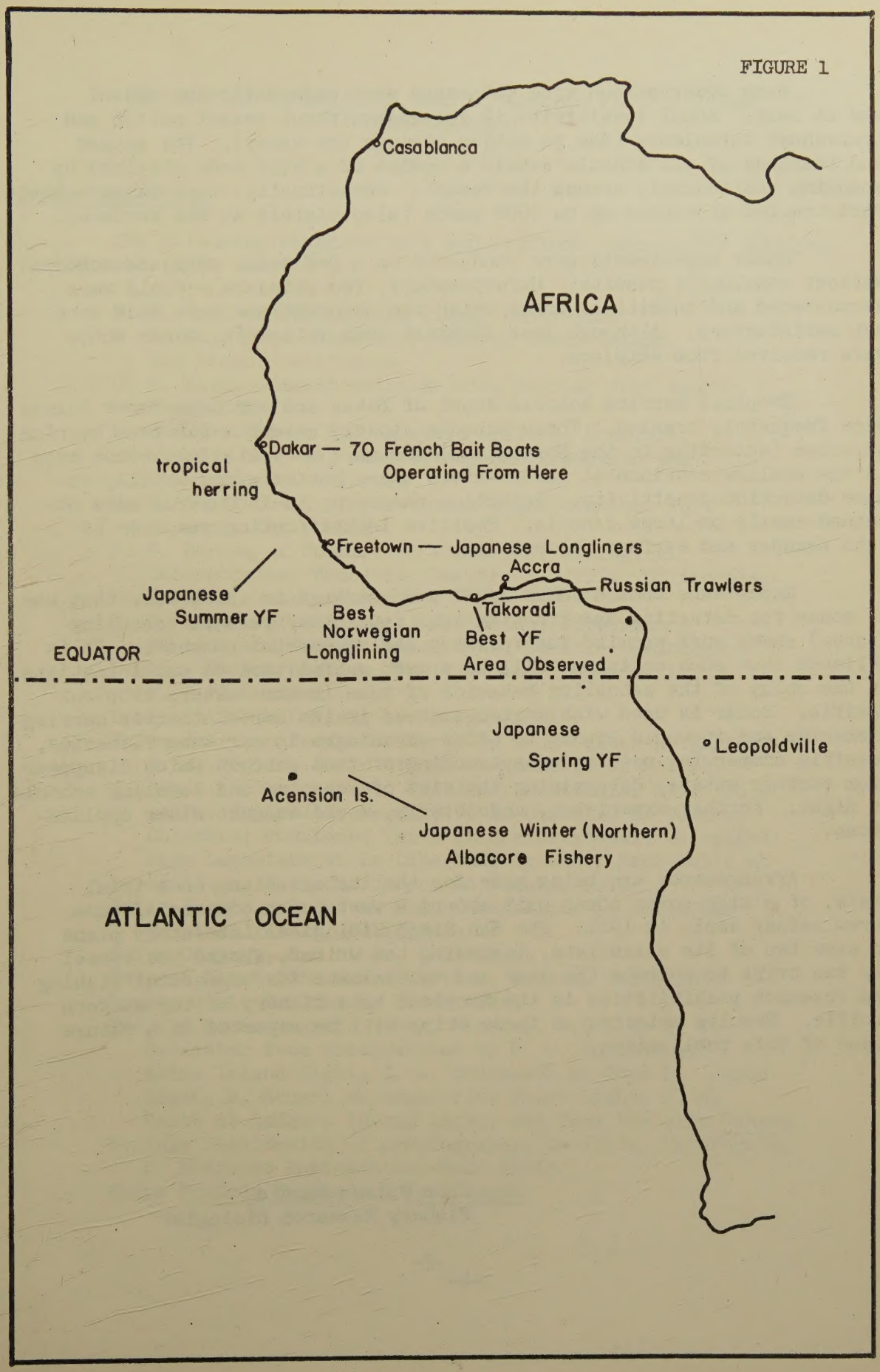
At the kind invitation of Dr. G. Rollefsen, Director, Institute of Marine Research, Bergen, the San Diego Biological Laboratory was able to have an observer (the writer) aboard the Norwegian research vessel JOHAN HJORT on its recently (October - November 1960) completed cruise in west African waters where sonar detection and tracking of tuna were successful at ranges of over one mile. Use of sonar equipment on tuna prompted our sending the scientist on this expedition.

The Norwegian government is sponsoring an eight vessel fishing fleet which began a six month commercial tuna fishing experiment off Cape Three Points, Ghana, (see Takoradi, Figure 1) in mid November. The vessels are typical multi-purpose craft used in the herring, cod and halibut fisheries in the north Atlantic. JOHAN HJORT was sent in October to conduct preliminary surveys of the tuna fishing areas between Senegal and Ghana before the arrival of the commercial vessels. The search for tuna began south of Dakar (Senegal) in mid October and continued south and east to Cape Palmas (Liberia) before any were sighted. The only major concentrations were found off Cape Three Points at the end of October and JOHAN HJORT engaged in observations and fishing experiments in that area until the yellowfin concentration disappeared in mid November.

The modern (1958) research vessel is equipped with high-power sonar. Tracking range of the sonar varies with conditions and type of target but it is capable of ranging almost two miles in ideal situations. The writer was instructed in use of the equipment by sonar operators with long experience in the Icelandic-Norwegian herring fishery where the gear is widely used. Operation of the sonar was not difficult and considerable time was spent in studying target identification. Since in the Cape Three Point area only tuna, tropical herrings and anchovies, whales and porpoises were found in quantity, identification of each was relatively easy.

The yellowfin schools off Cape Three Points presented ideal sonar targets because they were always above the thermocline and usually at or near the surface. Thermocline depth was between 15 and 25 fathoms in this area. Most schools observed were compact and generally appeared on the surface for about ten minute intervals before sounding. Frequent runs were made on schools visible beyond sonar range so that maximum detection of the instrument could be ascertained and evaluated. In each case when a large school was approached (at 10 knots) positive detection was possible at a distance of about 1500 yards. Schools at less than 1500 yards were tracked continuously without difficulty. Also, targets were, on occasion, contacted which apparently were yellowfin tuna but confirmation was not possible because they were not fished or later observed on the surface.

FIGURE 1


Casablanca
AFRICA
Dakar — 70 French Bait Boats
Operating From Here
tropical
herring
Freetown — Japanese Longliners
Accra
Russian Trawlers
Japanese
Summer YF
Best
Norwegian
Longlining
Takoradi
Best YF
Area Observed
EQUATOR
Japanese
Spring YF
Leopoldville
Acension Is.
Japanese Winter (Northern)
Albacore Fishery
ATLANTIC OCEAN

Many observations with the sonar were made while the vessel was at rest. Sonar sensitivity is greatest without vessel motion and transducer turbulence (due to motion through the water). The ranges and bearings of all schools within a radius of a mile were obtained by scanning continuously around the vessel. Occasionally, very large schools were tracked at ranges up to 2500 yards (also visible at the surface).

Sonar experiments were conducted on a few small skipjack schools without conclusive results. Unfortunately, few skipjack schools were encountered and conditions under which the observations were made were not satisfactory. Although less distinct than yellowfin, sonar echos were received from skipjack.

Tropical herring schools south of Dakar and off Cape Three Points were frequently tracked. These schools closely resemble European herring on sonar (according to the Norwegians) and gave very distinct echos even in the shallow continental shelf waters where bottom echos usually reduce detection sensitivity. Detection ranges up to 1500 yards were obtained easily on large schools. Positive identification was made by echo sounder and surface observation.

Experience aboard JOHAN HJORT demonstrated to the writer that use of sonar for detecting and tracking tuna (and other pelagic schooling fishes) shows much promise for research and commercial purposes. It is believed that such equipment will be a most useful tool to our scientists in the study of the schooling behavior of tuna in the eastern tropical Pacific. Sonar is used with marked success in the north Atlantic herring fisheries and it would appear to offer advantages in our tuna fisheries. Possible commercial use includes tracking of tuna schools which disappear from surface waters, determining the size of schools, and locating schools at night. Further experience, undoubtedly, would suggest other applications.

Arrangements are being made for the installation, on a trial basis, of a high-power sonar unit aboard a west coast commercial tuna purse seiner early in 1961. The San Diego Biological Laboratory plans to have two of its scientists, including the writer, aboard the vessel for two trips to operate the gear and to evaluate its commercial fishing and research possibilities in the tropical tuna fishery of the eastern Pacific. Results obtained on these trips will be reported in a future issue of this publication.

John Wilson Martin
Fishery Research Biologist

SEA-SURFACE TEMPERATURE CHARTS, EASTERN PACIFIC OCEAN
DECEMBER 1960

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Ships Frances Salman and Trolleggen

Charts

Figure 1.--Mean sea-surface temperatures (°F) derived from approximately 8000 observations. Squares show temperature at weather-ship stations. Numerals on shore are temperatures at coastal and light stations.

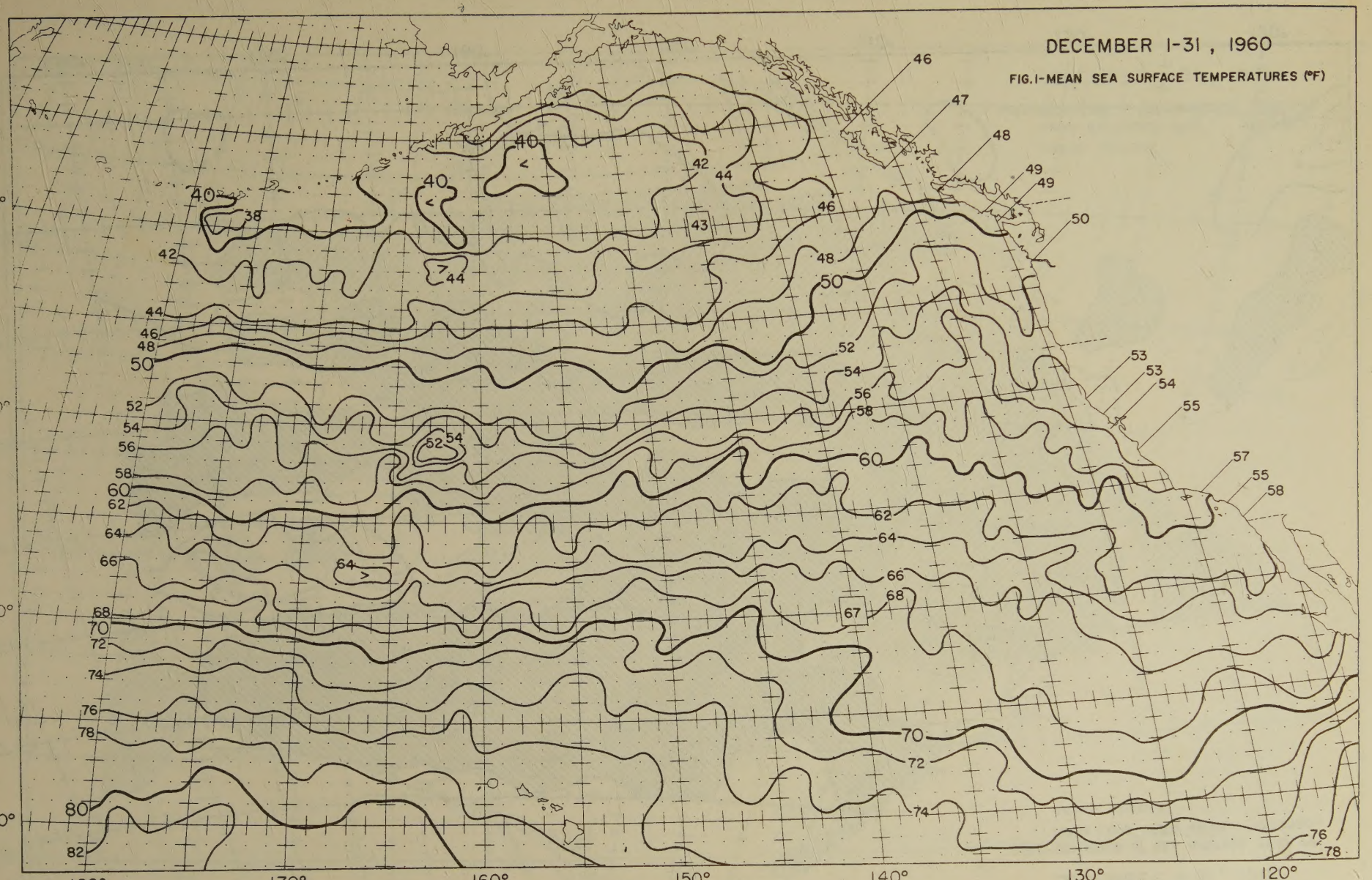
Figure 2.--Deviation of sea-surface temperatures (°F) from long term mean charts of H. O. 225. Hatched areas are colder than mean.

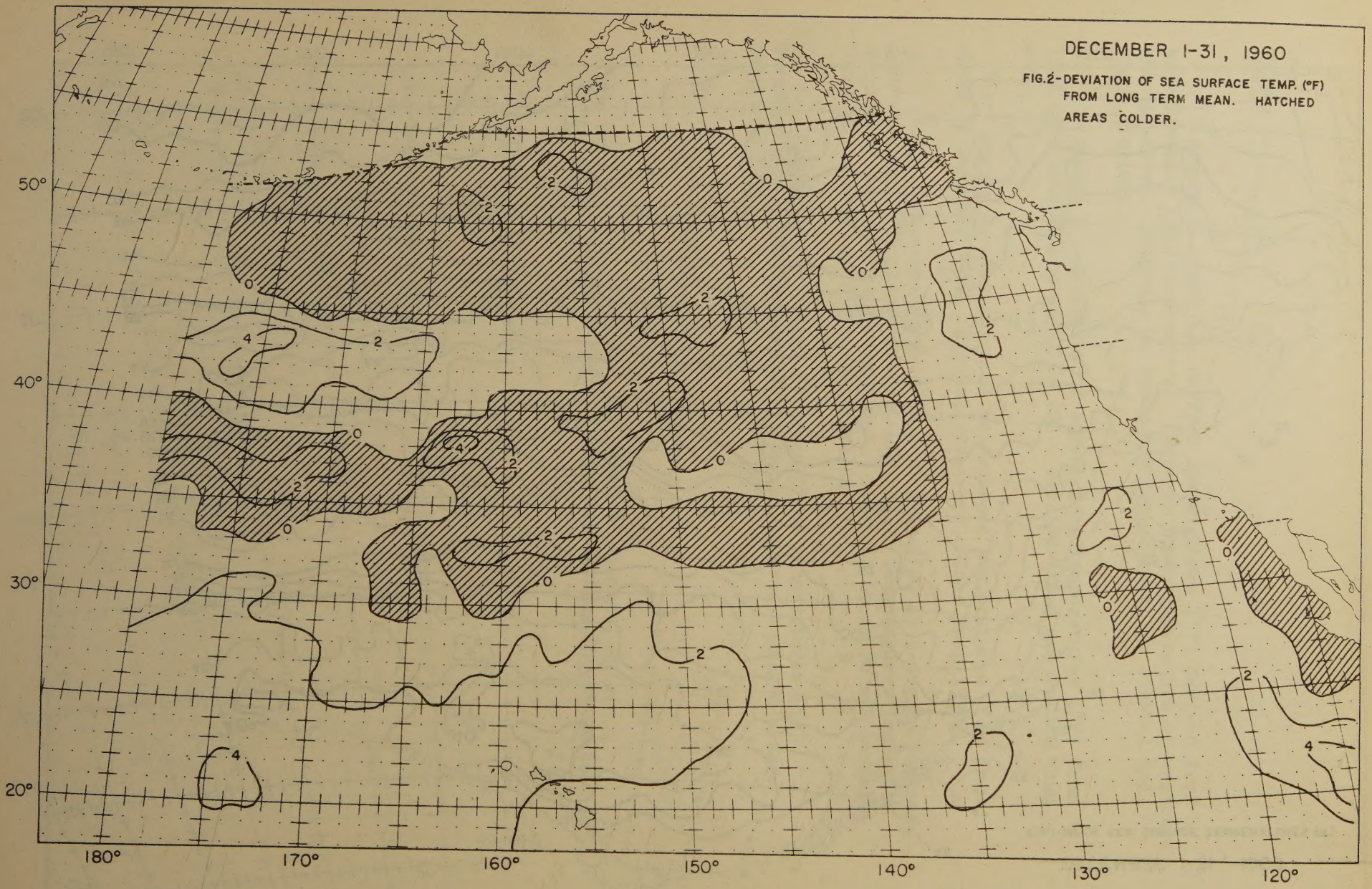
Figure 3.--Deviation of sea-surface temperatures (°F) from those of December 1959. Hatched areas are colder than 1959.

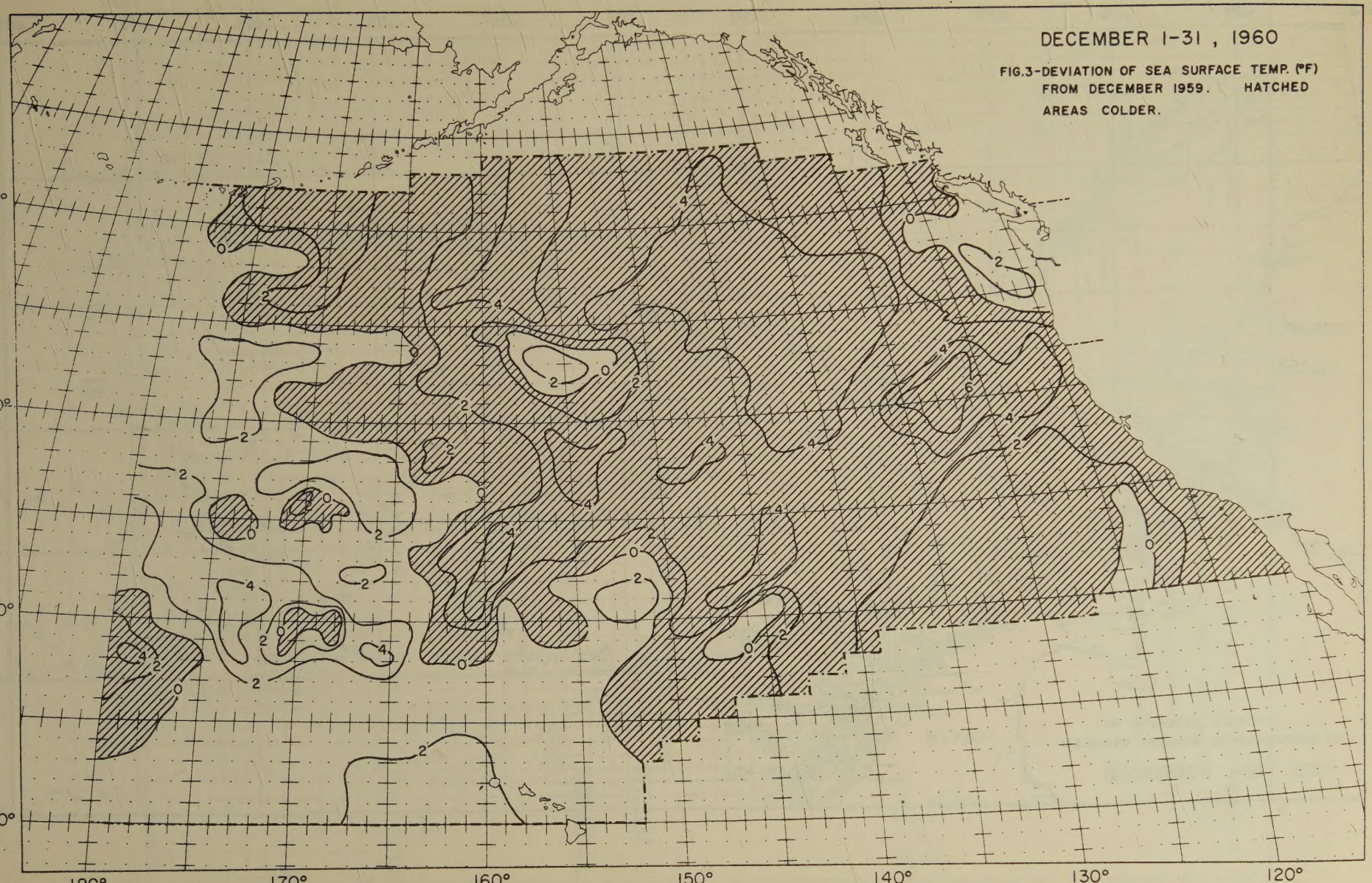
Figure 4.--Sea-surface temperatures (°F) by 1-degree squares, approximately 2000 observations. Line under temperatures indicates average of two or more observations. Numerals on shore are temperatures at coastal and light stations.

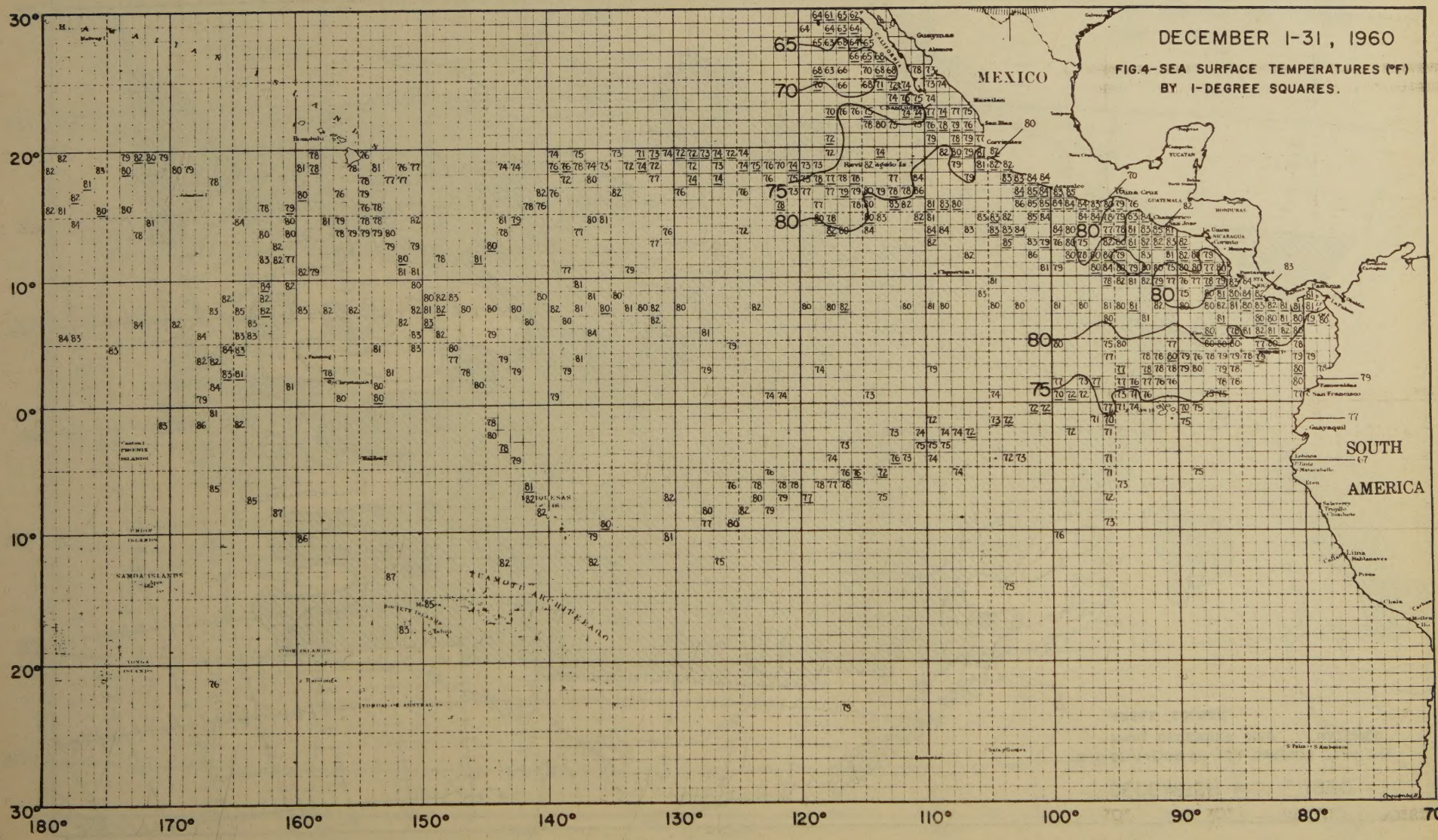
Figure 5.--Deviation of sea-surface temperatures (°F) December 1960 - December 1959 by 1-degree squares. Shaded areas colder in 1960.

James H. Johnson, Chief
Tuna Forecasting Investigation


DECEMBER 1-31 , 1960
FIG.1-MEAN SEA SURFACE TEMPERATURES (°F)
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


DECEMBER 1-31, 1960
FIG.2-DEVIATION OF SEA SURFACE TEMP. (°F) FROM LONG TERM MEAN. HATCHED AREAS COLDER.
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


DECEMBER 1-31 , 1960
FIG.3-DEVIATION OF SEA SURFACE TEMP. (°F) FROM DECEMBER 1959. HATCHED AREAS COLDER.
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


DECEMBER 1-31, 1960
FIG.4-SEA SURFACE TEMPERATURES (°F)
BY 1-DEGREE SQUARES.
MEXICO
SOUTH
AMERICA
30°
20°
10°
0°
10°
20°
30°
180°
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70

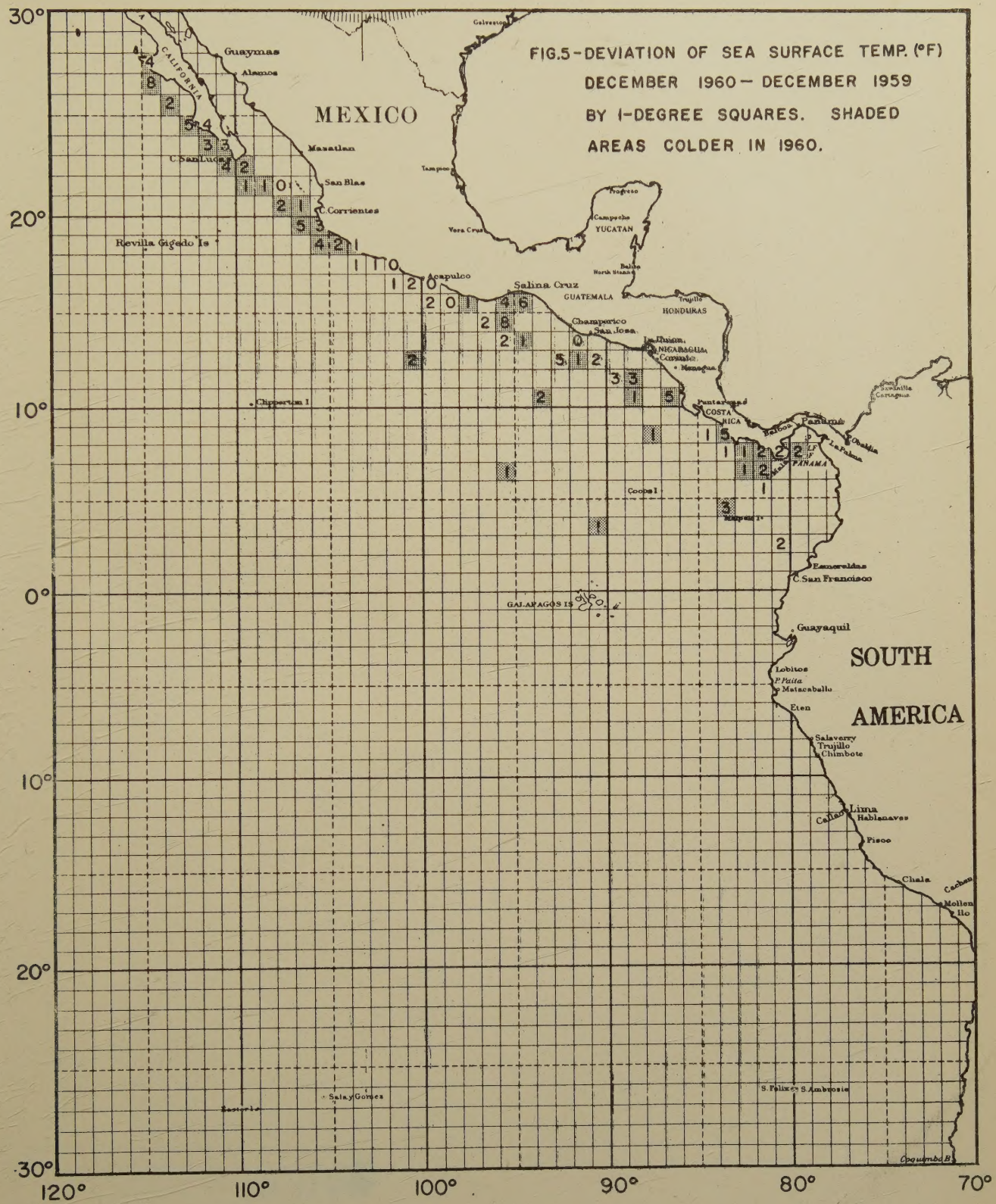


FIG.5-DEVIATION OF SEA SURFACE TEMP. (°F)
DECEMBER 1960 – DECEMBER 1959
BY 1-DEGREE SQUARES. SHADED
AREAS COLDER IN 1960.
MEXICO
SOUTH
AMERICA
CALIFORNIA
Guaymas
Alamos
Mazatlan
C. San Lucas
San Blas
C. Corrientes
Revilla Gigedo Is
Tampico
Vera Cruz
Progreso
Campeche
YUCATAN
Belize
North Strand
Acapulco
Salina Cruz
GUATEMALA
Trujillo
HONDURAS
Champerico
San Jose
La Union
NICARAGUA
Corinto
Managua
Puntarenas
COSTA
RICA
Balboa
Panama
Chipperton I
Cocos I
Malpelo I.
GALAPAGOS IS
Esmeraldas
C. San Francisco
Guayaquil
Lobitos
P. Pitita
Matacaballo
Eten
Salaverry
Trujillo
Chimbote
Callao
Lima
Huacho
Pisco
Chala
Mollendo
Salas y Gomez
S. Felix
S. Ambrosio
30°
20°
10°
0°
10°
20°
30°
120°
110°
100°
90°
80°
70°

4700